DIGITALIZATION IS WEAVING ITSELF INTRICATELY IN OUR SOCIAL FABRIC AND THE INTERNET OF THINGS (IOT) IS JUST ONE SUCH, ALBEIT HUGE, EXAMPLE. In fact, it is expected that IoT will become an integral component of every industry sector, public, government, organizations, etc. It seems that it is going to be in every device, tool, or gear we use. It is also going to be in every location we can imagine: cities, farms, hospitals, oil fields, military installations… you get the picture.

With this in mind, IoT will become part of our physical life. Meaning, any actions an IoT system will take will need to live with the constraints of the physical environment it is managing. For example, an IoT system monitoring gas valves in a refinery needs to collect data, analyze the data and make decisions on what actions to take in a very short time – real time or semi-real time (close to real time) – to prevent a possible disaster. You can similarly come up with examples in other industry sectors (e.g., healthcare, transportation, aviation, etc.) or corners in life where we need to react in real-time or near to real-time. But since the IoT field is maturing and becoming a reality, we will see serious uses for it as listed above, as well as the not-so-serious uses, such as having a smart kitchen pan. That said, I do not think that is a concern as I value experimentation and we just started dabbling with what IoT can do for society as a whole.

Edge computing came into the scene to handle multiple situations. One of them is when the latency between edge devices and the central backend where the analysis takes place is somewhat long – long enough to make the outcome of the decisions ineffective. Another situation is when the amount of data that need to be transferred to the backend is unreasonably large that may cause considerably large network congestion and could easily be reduced if fully or partially analyzed at the edge. A third situation is when there is a legal requirement to keep the physical data close where the devices are at the edge. Use your imagination and come up with other similar scenarios.

Another similar, but slightly different concept, is fog computing, which was introduced sometime in 2014. Both edge computing and fog computing try to achieve the same goal, but through different approaches. Fog computing moves intelligence to the IoT gateways or to the local area network. However, edge computing pushes intelligence to the edge devices – at the bottom of the architecture hierarchy. In my view, the differences between them are clear, but others may disagree and I am fine with that as in many instances definitions are not precise and I doubt my definition, above, will change that. That said, there is definitely confusion in the market as people use fog and edge computing interchangeably and will likely continue to do that for a few years from now until things get settled. Regardless, as one colleague mentioned, cloud computing brought a great deal of centralization in the last 10 years or so. IoT, on the other hand, is pushing us to partially move away from centralized and into more distributed or dispersed processing – mainly due to the reasons I listed earlier. The industry and the research community are working to find out how much compute/storage – intelligence - we should push away from centralized locations to the edge or somewhere in between. IoT is pushing us to think differently about IT because the physical world we live in is putting different constraints on IT. Please
note that moving intelligence around is just one, among many, essential topics for IoT. Others include, but are not limited to, reliability, software stacks, standardization, etc. These are all work-in-progress. Additionally, my message when I talk about IoT is always prepare for the unexpected in an IoT environment.

This 2nd 2017 issue of the IEEE Cloud Computing Magazine is a special issue on connecting fog and cloud computing. I would like to thank the guest editors for this special issue: Erik Elmroth, Philipp Leihtner, Stefan Schulte and Srikumar Venugopal for their effort to put this special issue together. Please review their introductory letter about connecting fog and cloud computing. The columns in this issue are also focused on fog, edge and cloud computing.**

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An IoT system generically includes collecting data from devices/sensors/etc.; massaging the data in some fashion to store it; analyzing the data to extract learnings to make decisions and then applying the decisions in the context of the IoT environment.